Coated base paper and a method for manufacturing coated base paper

Field of the invention

The object of the invention is coated base paper particularly suitable as base paper or release paper for labels, and a method for manufacturing coated base paper, wherein a barrier, i.e., protective layer is applicated to coated paper based on cellulose fibres.

Prior Art

Base papers, also known as release paper or backing papers, are used in the manufacture of label laminates and self-adhesive labels, and increasingly, also as packaging material for adhesive materials. Most commonly, base paper or release paper either is glassine-type transparent super-calendered and surface sized paper, or paper usually blade coated with pigments containing kaolin, for example, fine paper super-calendered as to be as impermeable as possible. Typical known prior-art laminate structures of pressure-sensitive labels are shown schematically in Figure 1 appended.

In Figure 1, base paper 10 has been applicated with a release coating 20, most frequently comprising silicone. A pressure-sensitive glue layer 30 has been applicated to the release coating 20 containing silicone, and a surface paper 40 forming a label has been affixed to the adhesive layer 30.

The silicone layer applicated to the base paper must be smooth and lacking holes, as the surface paper of the label then will detach in a smooth manner as desired, from the surface of the base paper. To achieve a smooth silicone layer lacking holes, the base paper cannot have holes, wrinkles, dust or unevenness. The surface of the base paper should be sufficiently sealed to prevent the silicone from

penetrating into the base paper. Neither may the base paper chemically affect the catalytic hardening of the silicone. If holes are present in the base paper, adhesive from the adhesive layer may penetrate the silicone layer to the base paper, resulting in fissures and breaks in the web of the litter path and of the label laminate during subsequent processing.

In general, the silicone is applicated onto the base paper in a thickness of 1 to 1.25 g/m^2 and cured at approximately 140 °C. Silicones being expensive, efforts are to applicate the silicone in as thin layers as possible, but on the other hand, due to the good detachment characteristics, nonetheless is necessary to manufacture the silicone layer to have sufficient thickness so as to in advance prevent the appearance of possible problems and breaks because of holes, porosity, and surface unevenness often present in fine paper. To be able to decrease the use of silicone, the surface of the base paper should be as impermeable and smooth as possible.

The publication Wochenbl. Papierfabr. 122, No 11, p. 468 - 472 (1994) presents a process, wherein, to reduce silicone consumption, bleached paper having a grammage of 67 g/m^2 was applicated with surface sizing compositions comprising polyvinyl alcohol and carboxymethylcellulose, or polyvinyl alcohol and starch.

In patent JP 171 600/93 the coating of paper on both sides with polyvinyl alcohol is described, followed by treatment with pressurized steam and calendering.

In paper manufacturing, polyvinyl alcohol is commonly used as protective colloid in coating pastes. Particularly, polyvinyl alcohol grades having low molecular weight are suitable for coating pastes comprising kaolin-containing pigment mixtures and the like. Polyvinyl alcohol is also used as primary or auxiliary binding agent in coating and surface sizing compositions and as carriers for excipients such as fluorescent brighteners.

The drying of polyvinyl alcohol as a separate layer on a web is known to be difficult and energy consuming, as a leathery surface easily appears on the polyvinyl alcohol from where the water it contains is difficult to remove, resulting in the surface remaining uneven.

Based on the above it can be seen that there exists an obvious need for impermeable and smooth base paper of greater bulk and lower grammage, that is based on coated paper manufactured of chemical pulp, and by which one may achieve material savings, and which base paper needs only a thin layer of silicone as release layer when manufacturing label laminates, and for a method for manufacturing said base paper.

Object of the invention

An object of the invention is coated impermeable base paper, based on chemical pulp.

A further object of the invention is a method for the manufacturing of coated impermeable base paper, based on chemical pulp.

In addition, an object of the invention is the use of coated impermeable base paper, based on chemical pulp, as base paper and release paper for labels.

The characteristic features of the base paper according to the invention, of the method for manufacturing it, and of its use are set forth in the claims.

Summary of the invention

It has been perceived that the problems occurring in base paper according to prior art can be avoided or significantly reduced by using the solution according to the invention, wherein pigment-coated base paper based on cellulose fibres,

preferably on chemical pulp, is coated with a barrier layer preferably comprising polyvinyl alcohol.

Detailed description of the invention

In the solution according to the invention, one or several thin barrier layers are applicated onto pigment-coated paper manufactured from cellulose fibres, preferably primarily, particularly preferably in excess of 50%, from chemical pulp. The thickness of the layer is defined through measurement of the layer's grammage (g/m^2) by weighing the base paper and coated paper, or calculating by squares metres used and the flow of barrier chemical ($g/s/m^2/s$). Preferably, the paper is fine paper pigment-coated as known in the art, for whose coating has been used pigment paste comprising kaolin or carbonate, preferably kaolin paste, having a binding agent selected from the group comprising styren-butadiene latex, polyvinyl alcohol and other common binding agents used in the art.

Onto the coated paper, manufactured by methods according to prior art, 1 to 5 layers, preferably one layer of an aqueous solution comprising a barrier chemical is applicated, using a method non-contacting the web known *per se*, which method is selected from the group comprising a curtain coating method and a spray method performed by spraying. The barrier chemical is selected from the group comprising polyvinyl alcohol, acrylate-based barrier latexes of which as examples may be mentioned the Rebarco® series of the company Raisio Chemicals Oy, and their mixtures. Preferably polyvinyl alcohol is used having a short chain, the viscosity (mPas) and degree of hydrolysis (mol-%) varying in the ranges 3 to 98 - 15 to 99. The barrier chemical is applicated as an aqueous solution having a barrier-chemical content of 3 to 50 weight-%, preferably 3 to 25 weight-%, and particularly preferably 3 to 5 weight-%, so that the solution being applicated has a viscosity of at most 100 cP, preferably at most 50 cP. When using acrylate latexes as barrier chemicals, these may also contain fillers, pigments, styrene-butadiene latexes and other conventional binding agents. The barrier

chemical is applicated so as to have an amount of it preferably 0.5 to 3 g/m^2 in the base paper. Preferably, the application of the barrier layer is performed as on-line coating.

After the application of the barrier layer, drying is carried out using non-contacting drying techniques, with methods known in the art, such as IR or fluid bed drying methods. After drying, optional super calendaring may be performed. Already as such, the barrier layer according to the invention is impermeable to an extent that super calendering is not necessarily needed. In spray application and curtain coating methods, optionally pigments, surface-tension regulators, drying agents, anti-foaming agents and other excipients known in the art may be added to the barrier layer.

It is essential for the invention that a non-contacting method such as spray or curtain coating method is used for applicating the barrier layer, by which methods an impermeable homogenous surface is provided. As no device having parts contacting the web is used in these methods, they cause no breaks.

By the method according to the invention, base paper having an exceptionally impermeable, homogenous and smooth surface lacking holes can be manufactured. This results in that the amount of silicone used for the release layer can be reduced to approximately 0.7 g/m^2, as the silicone is not absorbed into nor penetrates the base paper. Siliconizing may be performed by any methods known in prior art, using any silicone or silicone emulsions known in the art from labels and release papers.

In addition, the amount of fibre material in the base paper can be reduced, as also the amount of binding agent in the coating paste, and the amount of actual coating paste can be reduced by up to 20 %, compared with conventional ones. Thus it is possible to manufacture base papers of lighter grammage, but being of at least as good quality as base papers known in prior art, and having a bulk similar to or

even higher than those. Calendering can be made lighter and standard thickness is achievable with lighter paper. Using the solution according to the invention, it is also possible to achieve significant reductions in the consumption of material.

The invention will be illustrated in more detail by the following examples; however, the invention is not intended to be limited to these.

Examples

Example 1

Manufacture of coated base paper, coated with polyvinyl alcohol using a spray method

Non-calendered paper Simkraft MF Special® having a grammage of 85 g/m^2 and blade coating of 12.5 g/m^2 was coated with a thin layer of polyvinyl alcohol by spray coating using a Helicoater device. Sample 1 was a reference sample not coated. In sample 2 polyvinyl alcohol Mowiol® having a degree of hydrolysis of 10 - 98, solid content of 5 %, viscosity of 64 cP, and the amount applicated being 1 g/m^2 was used. In sample 3 polyvinyl alcohol Mowiol® having a degree of hydrolysis of 15 - 99, solid content of 5 %, viscosity of 27 cP, and the amount applicated being 1 g/m^2 was used, and the same grade was used in sample 4, but then the solid content was 3 %, viscosity 18 cP, and amount applicated 0.5 g/m^2. Pigment coating of the base paper was carried out as blade coating, followed by drying, then barrier layer coating using either spray coating or curtain coating, drying, and optional calendaring, which was performed as sheets with a supercalender of production scale. The results with non-calendered samples are shown in Table 1 below, and with calendered samples in Table 2 below.

Table 1: Non-calendered samples

	Simkraft MF reference Sample 1	Simkraft MF+ 1 g/m^2 PVA Sample 2	Simkraft MF+ 1 g/m^2 PVA Sample 3	Simkraft MF+ 0.5 g/m^2 PVA Sample 4
BW (g/m^2)	90.4	90.2	90.9	90.3
Thickness (µm)	112	116	113	112
Bulk (cm^3/g)	1.24	1.29	1.24	1.24
Gloss 75 (%)	13	22	23	21
Ink abs. (%) NP mk abs.	42	30	30	33
Oil abs. (g/m^2) Unger oil abs.	2.08	0.76	0.73	0.54

Table 2: Calendered samples

	2 nips Simkraft MF+ tamb 272	2 nips Simkraft MF+ 1 g/m^2 PVA	2 nips Simkraft MF+ 1 g/m^2 PVA	2 nips Simkraft MF+ 0.5 g/m^2 PVA	8 nips Simkraft MF+ tamb 272
BW (g/m^2)	89.4	90.6	91.3	90.5	91.2
Thickness (µm)	83	82	81	83	82
Bulk (cm^3/g)	0.93	0.91	0.89	0.92	0.91
Gloss 75 (%)	48	69	68	66	52
Ink abs. (%)	33	22	21	20	30
Oil abs. (g/m^2)	0.71	0.06	0.19	0.13	1.1
PVA amount (g/m^2)	0	0.4	0.4	0.2	0

Ink-absorption values were significantly lower when using polyvinyl alcohol compared with the sample not having polyvinyl alcohol, and oil-absorption values were exceptionally lower when using polyvinyl alcohol than without it. Even without calendering, the grade from these tests was usable for siliconizing.